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The theoretical framework underlying the Total Guidance Information Support System is discussed under the following topics: (1) Review of Literature, (2) A Brief History of Guidance and Counseling, (3) Philosophies of Guidance, (4) Decision-Making in Relation to Guidance, (5) The Origins of Information Theory, (6) Various Uses of Information Theory, and (7) Information Theory and Counseling. The major dimensions of each topic are listed. A conceptual strategy chart (for using computers in guidance) and a systems capabilities chart as well as references and a bibliography are included. (JS)

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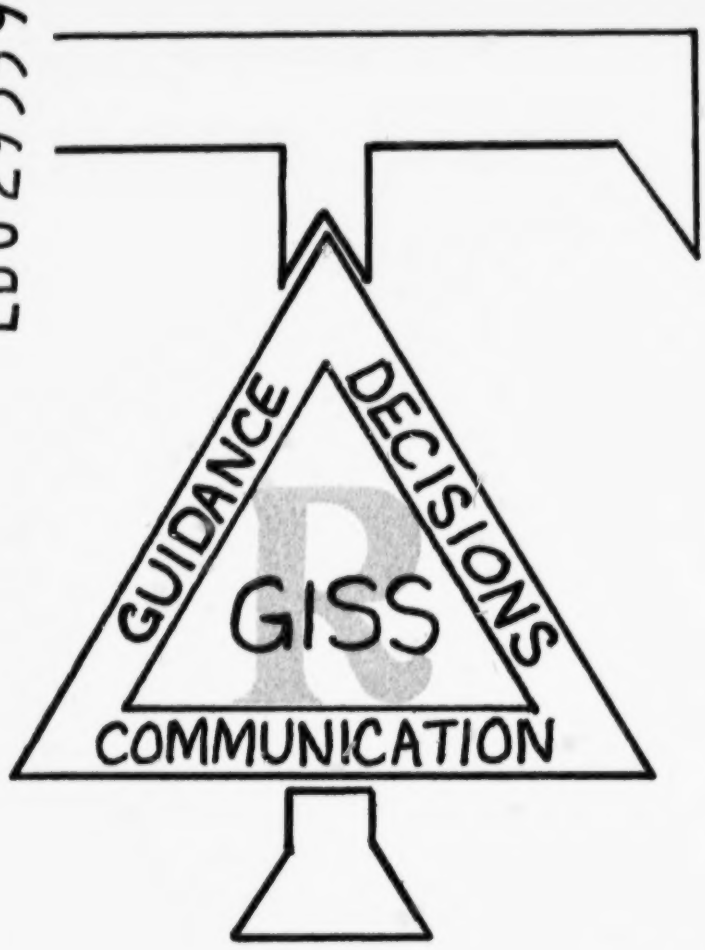

TECHNICAL MEMORANDUM 5

THE BARTLESVILLE SYSTEM

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TOTAL GUIDANCE INFORMATION SUPPORT SYSTEM

THE BARTLESVILLE SYSTEM

TGISS - NO. 5

THEORETICAL FRAMEWORK

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THEORETICAL FRAMEWORK

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If a new system is to survive the test of time, it must be predicated upon a sound theoretical base. Such a base cannot be a reality unless it is founded upon both the cornerstones of existing theory and foundation blocks of new findings and innovations which meet the needs of the system which is to cast its weight upon the base.

The system of concern here can best be described as a total guidance system that will provide the needed support for the public school counselor to perform as a professional rather than as a slave to what is obviously a rather prodigious paper shuffling administrative monster. This system is designed to lift the burden of the mundane clerical tasks which inhibit the quality and quantity of counseling services provided in today's schools. It is designed to integrate new approaches and to provide the counselor with the opportunity to utilize aspirations acquired while in his professional training.

Upon what kind of base does TGISS rest? To describe the underlying theoretical framework, it will be necessary to take a look

at the literature and examine existing theories of counseling, decision-making, communication, systems, and learning. The integration of these theories with some new innovations result in the evolution of a rationale to undergird TGISS and constitutes a new theory of guidance and counseling that will hopefully meet the academic-vocational and personal needs of all the young people who dare to enter the doors of American schools.

Review of Literature

Although guidance and counseling has only recently managed to advance to the initial stages of scientific endeavor, the concepts of guidance are definitely rooted in antiquity. Until the twentieth century, counseling generally was haphazard and impromptu. Since that time, however, numerous scholars have attempted to develop a comprehensive theoretical framework to promote both a uniformity in counseling procedures and reliable predictors of human behavior. The following review of literature pertinent to the field is designed to provide an historical picture of counseling and guidance development and also to indicate the current stage of advancement complete with the outstanding problems facing both the theorist and the practicing high school counselor.

A Brief History of Guidance and Counseling

The first recorded extant works relating specifically to guidance can be found in The Republic. Attempting to establish an ideal state, Plato advocated that men could find their place in society

only through extensive education. Such procedures would aid each individual in determining their optimum level of personal happiness and service to the state. Plato, in effect, held two basic assumptions: men's abilities differed widely and therefore should serve as a rational basis for division of labor; and there existed a closed-system universe containing pre-existent truths which could be discovered only by trained intellectual contemplation. Surprisingly, many of the propositions that Plato expounded are still widely held in counseling circles today, not as propositions, but as basic underlying assumption.

Throughout the middle ages, and extending into the American colonial period, educational and vocational guidance rested primarily upon religious tradition and the apprenticeship system. It was not until the early part of the twentieth century that guidance and counseling began to assume a scientific basis. The cornerstone for modern guidance techniques is traditionally assumed to be the publication of Frank Parson's book, Choosing a Vocation, in 1909. Parsons posited a three-step method of counseling: (1) know the student, (2) know the world of work, and (3) match the man with the job.

Thus, a rational framework for counseling began to be formulated. Parsons was keenly aware, however, that implementation of his concepts would be difficult, for psychological instruments to study individuals (step one) and to match the man with the job (step three) were largely absent at that time. Parsons did attempt to utilize the tests which were available. These included Galson's psychomotor capacities tests, Wundt's tests of psychophysical functions such

as memory, and the fledgling intelligence tests resulting from the efforts of Binet and Simon (1).

Unfortunately, after Parsons' death in 1908, emphasis on psychological testing was abandoned for several decades. Patterson (2) suggests that the counseling movement was later aided by the development of increasingly sophisticated intelligence tests, the study of retardation, inquiries into industrial turnover rates, and the initial acceptance in the United States of Freudian psychology. Thus, a theoretical framework was established and means of implementation began to be formulated.

Following the guidelines of Freudian and neo-Freudian schools of thought, counseling and guidance was dominated by those advocating a diagnostic or directive approach. Throughout the 1930's and 1940's, clinical counselors attempted to fully utilize psychological testing techniques to uncover individual traits most suitable for specific types of employment and simultaneously, to guide (along Freudian lines) personality development. Beck (3) states that the writings of the so-called directive counselors were undoubtedly the most highly regarded guidelines before the 1940's; thereafter, however, the non-directive approach began to become popular and eventually replaced the former as a major school of thought.

In reaction to the extreme diagnostic approach to counseling, proponents of the non-directive approach generally assume that the client has latent skills needed to solve his problems if they are allowed to emerge in a permissive situation. "Counselor participation,

at the level of test selection, deprives the client of the responsibility he needs to develop." (4) For the non-directive counselor, vocational guidance must be conducted within the framework of the total individual, and emphasis is on acceptance of the self. Personal adjustment must occur before occupational selection can be made intelligently. Thus, guidance is viewed as a learning process involving the total organism.

Until the 1950's, counseling and guidance attempted to establish itself as a science. Since that time, the counseling movement has been able to afford the luxury of internal dissension and today, numerous frames of reference are competing for acceptance. Perhaps the most novel approaches today are those of the phenomenological school and the followers of Carl Rogers (which are discussed below).

Thus, in reviewing the history of vocational guidance,

Williamson (5) lists seven major dimensions:

1. In the 1890's the objective analysis of man's capabilities.

2. Applications of psychological tests in Europe (and Frederick Taylor's time and motion studies) objectivizing psychometric tests prior to occupational training.

3. The use of experimental methods to determine job requirements.

4. The emergence of occupational ability profiles.

5. The revolutionary reconstruction of educational guidance.

6. The pioneering works of E. K. Strong, Jr., in measuring the concept of interest.

7. The development of rational reasoning about self in communicable terms.

Within a wider perspective, Beck (6) lists the following discernible trends: from 1900 to 1950 - counseling theory gaining acceptance as a professional field of endeavor; from 1950 to 1957 - the attempt to develop a systematic theory based on a philosophy of education; and from 1957 to the present - developing various schools of thought.

The above discussion reveals that at the beginning of the twentieth century, instruments and techniques began to be formulated to measure traits such as personality, aptitudes, and interests. Statistical techniques were also beginning to be employed for analysis and prediction of human behavior. The growth of social services, personnel work, manpower studies, and finally, developments in industrial sociology and occupational psychology have all given the counseling movement tremendous impetus. The influence of such diverse fields have aided in outlining the following activities which presently comprise the counseling and guidance movement: (7)

1. Analysis of the individual
2. Occupational information
3. Community occupational surveys
4. Group activities such as field trips and seminars
5. Individual counseling of high school students
6. Occupational placement

This discussion of historical trends within the counseling field will hopefully facilitate greater understanding of the various schools of thought, described below.

Philosophies of Guidance

With the emergence of sophisticated psychological tests and Freud's functional theory of human development, the early counseling movement consisted of analyzing the personal traits of individuals which determined their future occupational capacities. During the 1940's, many scholars began to object to the empirical-diagnostic methods of the trait-and-factor school. Many authorities felt that extreme empiricism, perhaps necessary in the past to gain acceptance, ought to be modified. Even more recently, Walters (8) argues that human values are incompatible with a physical science model. Bordin (9) however, feels that empiricism should not be modified, for behavioral analysis is capable of empirical verification. By 1950, the less empirical non-directive approach became the primary framework for the majority of professional counselors. Since that time, the philosophy of guidance has perhaps been affected most by such authors as Gordon Allport, Robert Matthewson, Ester-Lloyd Jones, Donald Super, and Carl Rogers.

Incorporating the results of sociological analyses, Gordon Allport (10) calls for greater personalism in counseling and suggests the incorporation of variables thought to be significant to personality development, thereby broadening educational planning and facilitating

a more thorough analysis of self and process. Accordingly, Allport expounds upon the self-concept and especially, the "emergent personality." A primary result of Allport's works has been utilization of the ideographic approach whereby each individual is viewed as a separate entity and is not pigeon-holed into a broad comprehensive theory of personality development as earlier clinicians and Freudian psychologists were wont to do.

Matthewson (11) attempts to explain contemporary guidance theory, in terms of field theory as postulated by Kurt Lewin. To Matthewson, guidance is a learning process involving the total organism. Ester-Lloyd Jones and Margaret Smith (12) have attempted to identify the underlying assumptions of modern guidance with various schools of thought. They postulate that if one of the latter can be demonstrated to fit the guidance model, then that philosophy could best dictate aims, procedures, and research designs. Wrenn (13) has also done extensive work in this area and implies that Dewey's pragmatism most closely approaches the major guidance models. Donald Super (14) has broadened the field of guidance considerably by indicating that either a firm developmental emphasis or a firm problem-solving emphasis is a function of the socioeconomic conditions of the political framework within thich counselors most operate. Some of Super's major contributions to the field of vocational guidance will be discussed in the next section.

A number of other writers have significantly influenced the field of guidance and counseling. Bordin (15) suggests that psychologists

are needed to help clients realize their own potential and that guidance workers must therefore assume administrative functions. Williamson (16) has raised the issue of counselors' values and feels that counselors ought to assume the role of a teacher of values, i.e. show the client how to live consistently within his own framework of values.

All of the above authors have contributed some segment to the non-directive approach. The chief spokesman, however, for client-centered counseling has been Carl Rogers who stresses the potentiality of the human being to solve his own problems of choice and adjustment. The following is a statement of the working assumptions of the client-centered approach as postulated by Rogers (17):

I. Every individual exists in a continually changing world of experiences of which he is the center.

II. The organism reacts to the field as it is experienced and perceived. This perceptual field is for the individual, reality.

III. The organism reacts as a whole to this phenomenal field.

IV. The organism has one basic tendency and striving - to actualize, maintain, and enhance the experiencing organism.

V. Behavior is basically the goal-directed attempt of the organism to satisfy its needs as experienced, in the field as perceived.

VI. Emotion accompanies and in general facilitates such goal-directed behavior, the kind of emotion being related to the seeking versus the consummatory aspects of the behavior, and the intensity of the emotion being related to the perceived significance of the behavior for the maintenance and enhancement of the organism.

VII. The best vantage point for understanding behavior is from the internal frame of reference of the individual himself.

VIII. A portion of the total perceptual field gradually becomes differentiated as the self.

IX. As a result of interaction with the environment, and particularly as a result of evaluational interaction with others, the structure of self is formed - an organized, fluid, but consistent conceptual pattern of perceptions of characteristics and relationships of the "I" or the "me", together with values attached to these concepts.

X. The values attached to experiences, and the values which are a part of the self structure, in some instances are values introjected or taken over from others, but perceived in distorted fashion, as if they had been experienced directly.

XI. As experiences occur in the life of the individual, they are either (a) symbolized, perceived, and organized into some relationship to the self, (b) ignored because there is no perceived relationship to the self structure, (c) denied symbolization or given a distorted symbolization because the experience is inconsistent with the structure of the self.

XII. Most of the ways of behaving which are adopted by the organism are those which are consistent with the concept of self.

XIII. Behavior may, in some instances, be brought about by organic experiences and needs which have not been symbolized. Such behavior may be inconsistent with the structure of the self, but in such instances the bahavior is not "owned" by the individual.

XIV. Psychological maladjustment exists when the organism denies to awareness significant sensory and visceral experiences, which consequently are not symbolized and organized into the gestalt of the self-structure. When this situation exists, there is a basic or potential psychological tension.

XV. Psychological adjustment exists when the concept of the self is such that all the sensory and visceral experiences of the organism are, or may be, assimilated on a symbolic level into a consistent relationship with the concept of self.

XVI. Any experience which is inconsistent with the organization or structure of self may be perceived as a threat, and the more of these perceptions there are, the more rigidly the self-structure is organized to maintain itself.

XVII. Under certain conditions, involving primarily complete absence of any threat to the self-structure, experiences which are inconsistent with it may be perceived, and examined, and the structure of self revised to assimilate and include such experiences.

XVIII. When the individual perceives and accepts into one consistent and integrated system all his sensory and visceral experiences, then he is necessarily more understanding of others and is more accepting of others as separate individuals.

XIX. As the individual perceives and accepts into his self-structure more of his organic experiences, he finds that he is replacing his present value system - based so largely upon introjections which have been distortedly symbolized - with a continuing organismic valuing process.

Clearly, the non-directive approach originated, in part, to impede the dominance of the diagnostic school. The former also originated as a result of the merging of two distinct fields: the study of aptitudes and the study of personal motivation. (18)

More recently, non-directive guidance and therapy has gradually merged with the phenomenological movement, most clearly advocated by Snygg and Combs. (19) Beck views such a merge as predictable because "both schools were dedicated to helping people in the stresses of daily living..." (20). The following paraphrases the basic contentions of Snygg and Combs (21)"

1. Choice is a pseudo-concept and does not occur in fact. To illustrate this point, the authors state:

> . . . we might say the individual is engaged in a process of making "choices." As a matter of fact, no choice whatever exists. He attempts that which

appears to him self-enhancing and attempts to avoid that which appears to him as threatening. What he does is dependent upon the differentiations he can make in his phenomenal field (22).

2. Behavior is regular and lawful.

3. The phenomenal field is the determinant of behavior.

4. Man can know only his phenomenal field.

5. There is a pre-existent reality, but man can know only that part of it which composes his phenomenal field.

6. Field perceptions at any given moment may exist at any and all levels of differentiation, from the vaguest to the sharpest.

7. The phenomenal fields of individuals are somehow connected and communication is possible.

8. Communication is the process of acquiring a greater mutual understanding of one another's phenomenal fields and can take place only when some mutual characters already exist.

9. All experiences are phenomenal in character; the fact that two individuals are in the same physical situation does not even give a relatively common experience.

10. People who share common roles in a common culture and its potentialities for common experiences inevitably develop common characteristics in their phenomenal fields and consequently in their behavior which mark them off from people of other cultures.

11. For reason 10 above, people of one culture tend to "objectify" their beliefs; these "givens" are not shared by those of other cultures, for the same reasons.

12. An individual's behavior has a one-to-one relationship with his phenomenal field; it is therefore possible to reconstruct, by inference, his phenomenal field.

13. To predict phenomenologically, one must follow two steps: Reconstruct an individual's field from his behavior, and understand how fields change.

14. The phenomenal field is always organized and meaningful, seen from the perspective of the person himself.

15. The field of any individual is both much more and less than the field which is potentially available in the immediate physical environment.

16. The phenomenal field is a product of selection, but the "selection" is carried on by the individual as a means of satisfying his needs, and in conformity with the existing organization of his phenomenal field.

17. The meaning of any situation or object is simply an awareness of the behavior that the object or the situation requires or enables him to make.

18. "Free Will" is a sham. It is an illusion seen from the restricted point of view of the behaver. An external observer sees so much evidence of causation that he must accept determinism. Prediction and control are possible only where behavior is lawful and caused.

19. At any given time the field of the given individual is organized with reference to his needs and the activity by which he is trying to satisfy them at the time.

20. Because of the great difference in the individual fields the same physical objects and events have very different significance in the fields of different individuals or in the field of the same individual at different times.

21. Memories of the past and expectations of the future will come and go as figure-ground in conformity with the needs of the individual.

Beck concludes that modern "guidance accepts phenomenology as its major model of human behavior." (23)

While the non-directive approach of Carl Rogers and the phenomenological principles of Snygg and Combs are attempts to develop a comprehensive theoretical framework for the field of guidance and counseling, the technique and methods employed to operationalize specific concepts comprise another complete realm of discussion. The concepts of vocational development and decision-making lend themselves to conceptualization and operationalization. Thus, they form a bridge between

the theoretical superstructure and the technical substructure of the counseling process. For these reasons, the following section is devoted to the area of occupational decision-making processes.

Decision-Making in Relation to Guidance

The decision-making theories of recent writers have been built upon fragmental concepts which, in some cases, preceeded them by several decades. A brief perusal of earlier contributions should therefore lead to a greater understanding of today's predominant theories.

The process of occupational decision-making has long been known to be a continuing process. As early as 1927, the National Vocational Guidance Association stated that occupational choice tends to be a developmental process which typically takes a period of approximately ten years. Such conclusions were drawn from pioneering studies of children's play activities (24) and adolescent development (25). In 1933, Charlotte Buhler (26) concluded that occupational choice evolved through a series of life stages and that such decision-making was largely an irreversible process. By 1936, Patterson and Darley (27) concluded that occupational choice was actually a compromise between interests, abilities, and opportunities. Combining the concepts of life stages and compromise, E. K. Strong, Jr. (28) hypothesized an increasing realism of choice with increasing age.

Eli Ginzberg et al. (29) attempted to unify these diverse concepts into a basic theory of occupational choice which would facilitate the study of human resources and decision-making. The basic elements

of Ginzberg's theory are as follows. First, occupational choice is a process involving three distinct stages. Before the age of eleven years, the child believes he can become whatever he wishes and makes fantasy choices. Between the age of eleven and seventeen, tentative choices are based upon factors such as interests and values. Eventually, reality factors are incorporated, and realistic choice is possible. According to Ginzberg, realistic decisions are made when the individual acquaints himself with alternatives (the exploration stage), determines his choice (the crystallization stage), and when his choice is delimited (the specification stage). Second, the process of occupational choice is largely irreversible because reality pressures introduce major obstacles to alterations in plans. Third, compromise is an essential aspect of every choice. A career is chosen by the individual which utilizes his interests and capacities and satisfies his values and goals. However, opportunities and limitations of the environment must be considered.

Donald Super (30) has offered a number of criticisms of Ginzberg's theory. First, states Super, the relationships between concepts are not adequately based upon previous works. Next, Ginzberg defines "choice" as preference. To Super, the two concepts are not identical and, in fact, the term "choice" does not mean the same thing to different age groups. Likewise, no distinction is made between choice and adjustment. Finally, Ginzberg fails to adequately analyze the compromise process, which is a major shortcoming, for compromise "is the crux of the problem of occupational choice and adjustment." (31)

Super then outlines the elements of an adequate theory of vocational development: (32)

1. Individual differences in attitudes, interests, and values must be recognized;

2. Each person has multi potentialities, i.e. the potential for success and satisfaction in a number of occupations;

3. Individuals prefer, enter, remain in, and succeed in occupations for which they have appropriate patterns or traits;

4. Childhood and adolescent identifications provide role models which facilitate the development of a self-concept;

5. Adolescents and adults face a succession of emerging problems which are peculiar to the various life stages, i.e. there is a continuity of adjustment;

6. The way such problems are solved determine basic career patterns;

7. Aptitudes and personality are the result of interaction between the organism and the environment, thus, development can be guided;

8. In the development of career patterns, the interaction of and dynamics of intelligence, interests, and social status is still unknown;

9. Satisfaction in one's job depends upon the extent to which the work, the job, and the way of life enable one to play the kind of role he wishes to play;

10. Adequate adjustment is most likely to result when the nature of the work itself and way of life that goes with it are congenial to the aptitudes, interests, and values of the person in question.

Although Super's works possess obvious improvements over Ginzberg's earlier writings, several shortcomings still remain. In consistent fashion, Super refers to the above ten elements as theories. At best, they are propositions and at times approach only elements of

propositions. Also, the propositions as presented are not operationalized (such as "way of life") and thus are really tendency statements. Super has failed to construct a comprehensive theory of vocational development inasmuch as the various propositions are not linked together to form deductive interdependencies. In addition, one needs to know how certain "intervening variables" affect the outcome of vocational development. Unless they can be systematically incorporated into the theoretical framework, their effects will remain non-measurable. Finally, it should be noted that none of the above authors have provided a clear statement on the actual process of decision-making.

A number of other studies have contributed to the basic framework developed by Super and Ginzberg. Anne Roe (33) has examined vocational decision-making within the framework of personality development as viewed by psychoanalytic investigators and hypothesizes that persons from accepting homes will demonstrate a major orientation toward other individuals and will tend to select occupations classified (by the author) as service, business contact, cultural, and arts and entertainment occupational groups (34). Little research, if any, has directly supported such suggestions.

Tiedeman (35) has proposed that vocational development is oriented by decisions in one of two periods: the period of anticipation, and the period of implementation and adjustment. The period of anticipation is comprised of three stages: (1) the exploration stage wherein activities are random; (2) the crystallization stage in which patterns emerge in the form of alternatives; and (3) the choice stage which

involves clarification, commitment, and preparation for implementation. The period of implementation and adjustment involves (1) indiction or the initiation of implementation, (2) transition wherein the group goal is attacked and comes within the field of the individual, and (3) maintenance, i.e. the person strives to keep intact with the resulting organization and maintain equilibrium. Tiedeman then attempts to operationalize factors in the decision-making process via a sophisticated mathematical model. Realizing that such a model is based upon rational normative processes, he asserts that the counselor's role is to "enhance the operation of reason" (36), freeing the person for progress, and helping the client view decisions in relation to those taken and those possible. Though in contrast to various non-directive approaches, Tiedeman attempts to bridge the gap between the non-directive approach, the diagnostic school of thought, and the psychoanalytic model of guidance.

John Holland (37) has posited the following occupational environments and individual orientations which form a hierarchy for every person:

1. The mororic environment
2. The intellectual environment
3. The supportive environment
4. The conforming environment
5. The persuasive environment
6. The esthetic environment

Each orientation represents a life-style characterizing preferred methods of handling daily problems. Within a class of occupations

the level of choice is a function of intelligence and self-evaluation (i.e. a self concept). The latter may be measured by the OL scale of the Strong or Sime occupational status scale. Thus, occupational level = intelligence + self-evaluation. The counselor's role appears to be one of increasing the client's self-knowledge, for "self-knowledge operates to increase or decrease the accuracy with which the person makes a choice." (38) Self-knowledge is defined as the ability to discriminate among potential environments in terms of one's own attributes.

Holland has sketched an outline of vocational decision-making, but states further knowledge is needed concerning what constitutes a self-concept, how it can be measured, and its relationship to intelligence as measured by modern IQ tests. The major shortcoming of Holland's work is the somewhat artificial manner in which he forces occupation into particular classifications.

The framework for vocational development has been considerably widened by Blau, Gustad, Jessor, Parnes, and Wilcock (39) who have introduced an array of concepts relating to the factors involved in decision-making, the compromise of preferences and expectations, individual value orientations, employment conditions relevant to rewards, changes occurring with successive stages in the individual's life history, knowledge of opportunities, and the manner in which alternatives impose limiting conditions upon choice. In the attempt to integrate concepts from psychology, sociology, and economics, the authors concur that occupational choice is a developmental process and that human interaction is an essential part of development. Further, they state that occupational

preferences do not directly determine occupational entry; thus, the process of selection must be studied as well as the process of choice. The former implies analysis of historical, economic, and social conditions; the latter implies investigation of personality development. Blau, et. al. summarize their conclusions in the following manner (40):

1. The conceptual scheme presented is not a substitute for a theory of occupational choice and selection, but merely a framework for systematic research which, in due course, will provide the material needed for constructing such a theory.

2. The social structure affects occupational choice in two analytically distinct respects; as the matrix of social experiences which channel the personality development of potential workers, and as the conditions of occupational opportunity which limit the realization of their choices.

3. Although four characteristics of individuals and four of occupations have been specified as determinants of occupational entry, the two crucial questions are: what developments in the lives of potential workers and in the history of the socioeconomic organization determine these characteristics, and what are the processes of choice and selection through which they affect occupational entry?

4. Occupational choice is conceived as a process of compromise between preferences for and expectations of being able to get into various occupations. This compromise is continually modified, since the experiences of individuals in the course of searching for suitable careers affect their expectations and often also their preferences.

5. Lest the complicated and extended developmental process that culminates in occupational choice be oversimplified, it is necessary to consider it as a series of interrelated decisions rather than as a single choice. The repeated application of the suggested framework for analysis at crucial turning points in the lives of individuals makes it possible to trace this development and to show how earlier decisions, by narrowing the range of future possibilities, influence the final choices of occupations.

6. The analysis of the processes by which individuals choose one occupation in preference to others must be complemented by an analysis of the processes by which some individuals, and not others, are selected for a certain occupation. To be sure, it is legitimate scientific procedure to treat the actions of selectors as given conditions in the investigation of occupational choice, and it is equally legitimate to treat the actions of choosers as given conditions in the investigation of occupational selection, but only the combination of both procedures makes it possible to explain why people end up in different occupations.

Although this article is concerned with the determinants of occupational entry, not its consequences, the distinction between the latter and the former breaks down once historical developments are taken into account, since the consequences of earlier occupational choices and selections become determinants of later ones. A labor shortage may result in changes in the wage structure or in technological reorganizations that permit the employment of less skilled workers - new conditions which help determine future occupational entry. When it becomes generally known that dissatisfaction with their career is less prevalent among the members of one occupation than of another, these psychological consequences of occupational entry become one of the rewards the anticipation of which influences the occupational choices of the next generation.

Whether a person experiences upward mobility or finds his aspirations frustrated in his career will also find expression in the orientation toward occupational life that he transmits to his children and thus in their occupational choices. At these points where consequences turn into determinants, the study of occupational choice and

selection merges into the economic study of labor markets, the psychological study of personality adjustment, and the sociological study of social mobility (41).

Other writers have offered specific contributions. Segal (42) predicted background differences between successful accountants and creative writers as measured by Rorschach tests. Nachmann (43) compared backgrounds of men in law, dentistry, and social work via biographical interviews. Galinsky (44) used a similar technique to compare backgrounds of clinical psychologists and physicists. These studies did find evidence of childhood experiences affecting vocational choice. On the basis of these results, Bordin, Nachmann, and Segal (45) have collaborated to broaden a psychoanalytic framework encompassing vocational development. In a somewhat different vein, Super and Bachrach (46) have attempted to integrate trait and factor theory with psychological findings concerning personality development. They state that classical trait theory becomes less appropriate to the study of adults, for variables normally stressed in the personality approach become prepotent while social variables continue to exert themselves as strongly as ever at these stages.

Research analysts in the field of guidance originally focused attention upon the trait and factor framework and thereby failed to consider social and economic factors potentially influential in the decision-making process. Recently, Super and Bachrach and Blau et. al. have attempted to bring such factors into the counseling and guidance perspective. At present, therefore, authorities in the field have moved

from a narrow mechanical trait-matching orientation to a greatly enlarged theoretical framework. Within this process, problems as well as advantages have accrued, however, and future investigations are faced with systematically unifying the present explosion of knowledge and operationalizing a whole host of variables. The current investigation is an attempt in that direction.

The Origins of Information Theory

When Samuel F. B. Morse began the art of telegraphy in 1832, numerous practical problems soon arose such as intersymbol interference, electrical noise, and appropriate voltage transmission. To overcome such problems, mathematical analysis was needed. Mathematics was applied to this area of endeavor as early as 1855 by Lord Kelvin, who calculated what the received current would be when a dot or space is transmitted via a submarine cable. Alexander Graham Bell attacked the problem more successfully and opened the area of telephony to mathematical scrutiny by such men as Poincare, Heaviside, Pupin, and Campbell (47). Also, Fourier's analysis of sine waves later became a powerful tool for transmission problems. Fourier's findings provided mathematicians with a bewildering variety of results, many of which were not clearly understood. There was, for decades, a number of disputes among telegraphists concerning various combinations of signals alleged to have desirable properties. In 1924, Nyquist's publication, "Certain Factors Affecting Telegraph Speed," solved many of these problems. A second paper in 1938, "Certain Topics in Telegraph Transmission Theory," summarized

Nyquist's works which embrace much important material now embodied in communication theory (48). Briefly, Nyquist showed that the number of distinct, different current values which can be sent over a circuit per second is twice the total range or band width of frequencies used. Thus, the rate at which letters of text can be transmitted is proportional to the logarithm of the number of current values used (49).

In 1928, R. V. L. Hartley published a paper entitled "Transmission of Information" in which he depicted the sender of a message as equipped with a set of symbols from which he mentally selects symbol after symbol, thus generating a sequence. He then defined the information of the message as the logarithm of the number of possible sequences of symbols which might have been selected (50). Modern communication theorists now know this to be true if successive symbols are chosen independently and if any of the aymbols are equally likely to be chosen. Finally, Hartley and Nyquist concluded that the amount of information which can be transmitted is proportional to the band width (the width of a band of electrical frequencies) times the time of transmission.

After the works of Nyquist and Hartley, communication workers specialized in constructing particular systems, which received added emphasis with the advent of World War II. However, "no broad philosophical principles were laid down" (51) at this time.

During the war, a crucial problem arose in being able to track the course of airplanes via inaccurate or "noisy" radar. In essence, the problem was one of dealing with a number of possible signals, but

not knowing in advance the signal to be dealt with (52). In Russia the problem was solved by A. N. Kolmogoroff and in the United States by Norbert Wiener whose famous publication, Cybernetics (53), appeared in 1948. Wiener's name became associated with the field of extracting signals of a given ensemble from noise of a known type. In the same year that Wiener's publication appeared, Claude E. Shannon published A Mathematical Theory of Communication (54) which is today regarded as the foundation of modern communication theory. Unlike Wiener, Shannon concentrated on the study of encoding messages chosen from a known ensemble so that they can be transmitted accurately and swiftly in the presence of noise. "This matter of efficient coding and its consequences form the chief substance of information theory."(55) The later part of the decade witnessed two other contributions to the area of communication: Gabor's paper entitled "Theory of Communication" (1946) and Tuller's work, "Theoretical Limits on the Rate of Transmission of Information" (1949). It is Shannon's work, however, that marks the beginning of a comprehensive theoretical structure concerning communication and information.

Various Uses of Information Theory

An approach to a theory concerning the conditions under which communication successfully takes place has been made by Heider (56), Newcomb (57), and Cartwright and Harary (58). Basic to all three is the concept of system, i.e. a set of dynamically interdependent units. Heider considered the states of balance in cognitive

fields which consist of two people and an impersonal referent. Newcomb extended this theory to objective impersonal relations with respect to a common referent. Employing the term, "strain toward Symmetry," Newcomb theorizes that communication takes place between two people, A and B, about a referent X, when there is a positive attitudinal relation between A and B and the attitudes of both to X have the same sign (negative or positive). Cartwright and Harary have attempted to formulate the concepts of Heider and Newcomb in terms of the mathematical theory of graphs. The general thesis of such works is that an important psychological aspect of communication is its function of enabling two or more individuals to maintain simultaneous orientation towards one another as communicators and toward objects of communication.

The literature clearly supports the contention that transmittal of useful information from counselor-teacher to student (communication) is basic to providing adequate guidance services. Such transmittal of information may be accomplished through one of several modes. Examples include:

1. Retrieval and transmittal of factual data.

2. Playing games that provide not only information, but opportunities to develop skills in decision-making.

3. Remedial education through computerized instructional programs.

4. Conversational dialogue between student and computer that provides self understanding and awareness.

In general terms, information theory grew out of the study of particular problems of electrical communication which have briefly been cited in the above discussion. Today, the areas of systems analysis, information theory, and cybernetics have a great deal in common. There has recently been a movement among mathematicians and physicists to interest themselves in various types of open systems with feedback potential. This investigation will focus upon such systems, of which the computer is an example, which interact with their environment, processing inputs according to pre-programmed routines built into the system and producing outputs in a purposeful and objective manner. In general terms, the receipt of fresh inputs from the environment leads to further iterations of the cycle until the resulting outputs meet the built-in criteria of satisfaction or achievement. Thus, a major assumption of the current research is that living organisms can be successfully modeled upon examples of such open systems with feedback. It is becoming increasingly apparent that men and machines must operate together to create a suitable environment, for many problems are of such great complexity that no man can be considered an expert on every aspect of the situation.

Information Theory and Counseling

One of the primary components of the counseling role in the public schools in the utilization of information. Specifically, the counselor must engage in compilation and dissemination of pertinent information concerning the individual student. The primary competencies

expected of counselors are the ability to employ useful information in meaningful ways, to provide instruction to facilitate vocational awareness, to diagnose learning problems, to refer learning problems for adequate remedial education, to help youngsters select proper course schedules, and to facilitate self-concept development relative to the economic and social factors affecting the individual.

The literature is replete with theories concerning these competencies. The weakest link seems to be related to the counselor's ability to employ occupational information. "The literature is virtually devoid of material pertinent to this particular competency."(59) Shostrom and Brammer state that unless further attention is focused upon this area, it may become "one of the weakest links in the counseling process." (60)

Today's counselor is faced with the fact that he cannot be an authority upon recent developments in tests and measurements of human factors and at the same time possess exhaustive information concerning each client, to say nothing of occupational opportunities on the local and national level. Therefore, a systems analysis approach employing computer programs containing exhaustive information filed with easy accessibility is rapidly becoming a necessity to the modern practicing counselor.

The theoretical base postulated to undergird the total guidance information support system (TGISS) is essentially synergistic in nature. It is predicated upon four basic postulates incorporating counseling, decision, communication, learning, and information theory.

P:1 There are six basic modules in the decision making process. (See The Conceptual Theory for Utilizing a Computer Support System in the Student Decision-Making Process)

P:2 The counselor is a change agent in the student decision-making process. He provides interpretation of information, empathy, and reflection.

P:3 The computer functions as an input-output-process device that stores, analyzes, and transmits information to the counselor for interpretation to the student. Secondly, it can function as a teaching machine for instructional purposes.

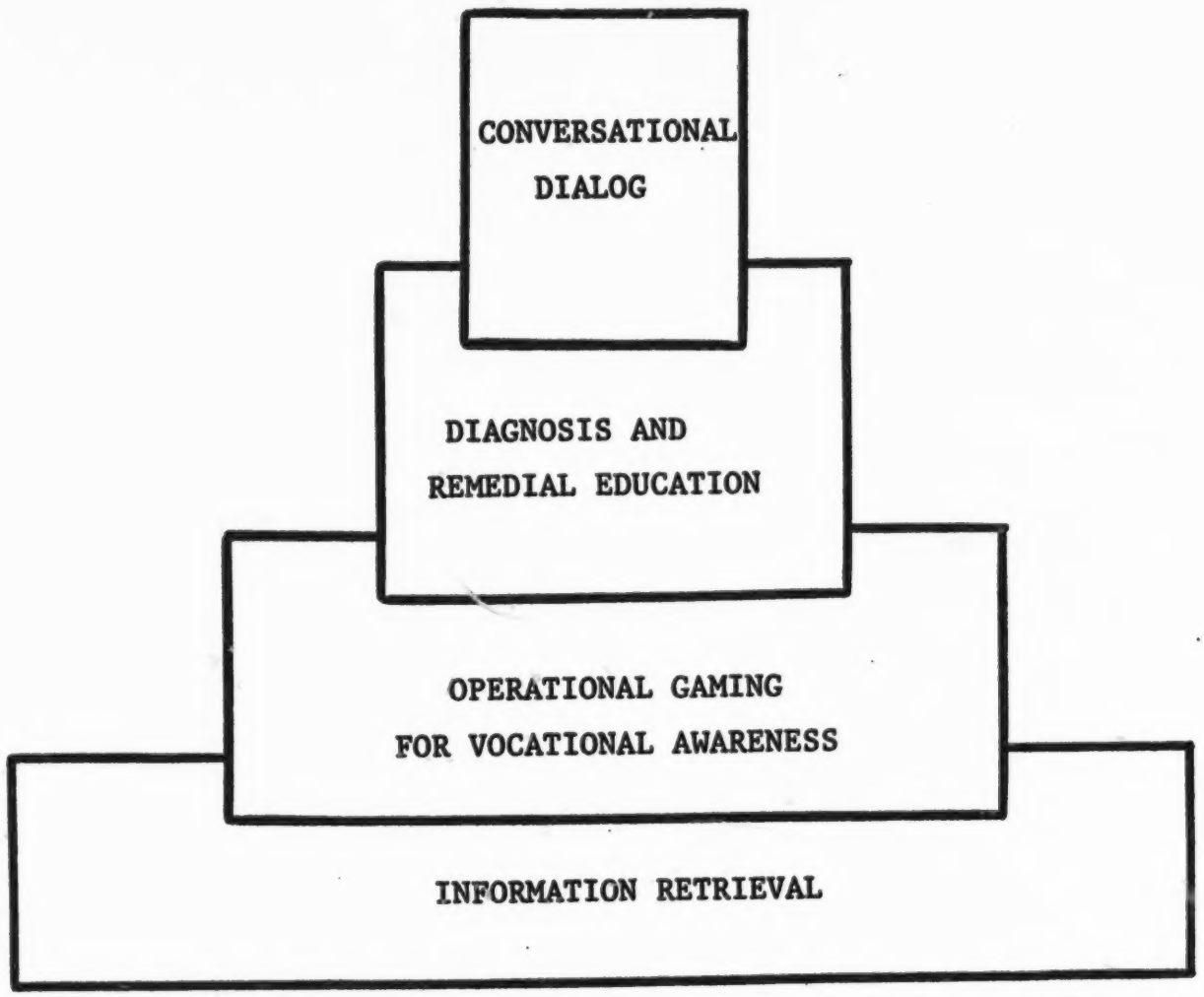
P:4 The student is the decision-maker. The quality of his decisions and behavior depend upon his ability to utilize the communicative processes, to access information, and adjust his subjective self to objective reality.

TGISS has been designed to provide congruence between system capabilities and the need for support in the areas of information retrieval, vocational awareness, diagnosis, remedial education, and vocational - educational guidance. (See System Capabilities) However, the system's effectiveness can only be realized in conjunction with those counselor orientations which help the student to discover insights into his problem and accept them. It can never provide the skill necessary to express attitudes and ideas in light of the client's characteristics as he enters into a one to one relationship and of the dynamics of the relationship as it progresses. The system is premised upon the assumption that a counselor should continue to deal with the when and how of doing things in the counseling conference e.g., throwing responsibility, listening, screening and controlling the flow of information, interpreting, expressing reinforcement, leading on further with a topic, closing a conference, etc.

A CONCEPTUAL STRATEGY FOR UTILIZING A COMPUTER SUPPORT SYSTEM
IN THE STUDENT DECISION-MAKING PROCESS

Decision Module	Counselor Function	Machine Function	Process	Counselee Function	Operational Mode
Uncertainty	**********	**********	**********	Perceiving	Thinking
Analysis	Change Agent	Information	Data Reduction	Seeing	Analyzing
Alternatives	Change Agent	Information	Hypothesis	Querying	Conceptualizing
Verification	Change Agent	Information	Synthesis	Preferring	Deducing
**********	**********	**********	Decision	Behaving	Acting
Evaluation	Empathy	Information	Testing	Confirming	Research
Confidence	Reflection	Information	Implementation	Behaving	Application

T G I S S



SYSTEM CAPABILITIES

The logic of such a system is based on the fact that no arbitrary criteria can be established since we are attempting to help young people find solutions to living problems in a real world with little semblance of the glass cage environment of an experimental laboratory. The variables, their interrelationships with one another, and their value to the individual within the community, must be provided for. Hopefully, the counselors of tomorrow with the support of TGISS and/or other similar systems will meet this need.

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APPENDIX I

REVIEW OF LITERATURE
CONCERNING INFORMATION THEORIES
SINCE 1953

(Abbreviations are as found in Educational Index)

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